

REMARKS/ARGUMENTS

1. Claims 1, 2, 4, 5, 9-15, 17, 18, 22-29, 31, 32, and 36-40 are Patentable Over the Cited Art

The Examiner rejected claims 1, 2, 4, 5, 9-15, 17, 18, 22-29, 31, and 32 as anticipated (35 U.S.C. §102) by DiCorpo (U.S. Patent Pub. No. 2004/0139240). Applicants traverse for the following reasons.

Claims 1 and 28 concern interfacing with device hardware supporting a plurality of devices included in the device hardware, and require: initializing a device interface driver to represent the device hardware as a virtual bus to an operating system and to represent to the operating system each device supported in the device hardware as a device attached to the virtual bus; initializing the device hardware; accessing the device hardware to determine the devices included in the device hardware; generating one device object for each determined device in the device hardware, wherein each generated device object represents the determined device to the operating system; and reporting the determined devices to the operating system, wherein the operating system loads a device driver for each of the reported devices supported by the device hardware.

The Examiner cited para. 80 of DiCorpo as teaching the claim requirement of initializing a device interface driver to represent the device hardware as a virtual bus to an operating system and to represent to the operating system each device supported in the device hardware as a device attached to the virtual bus. (Final Office Action, pg. 5) Applicants traverse.

The cited para. 80 discusses initialization for LUN virtualization. On powerup, the system has no known state. The initialization procedure collects information for storage in the device state cache to enable LUN virtualization.

Although the cited para. 80 discusses LUN virtualization, which creates virtual storage for a hardware device, nowhere does the cited para. 80 anywhere disclose or mention the claim requirements of representing device hardware including a plurality of devices as a virtual bus and representing to the operating system each device in the device hardware as a device attached to the virtual bus. Instead, the cited para. 80 discusses LUN virtualization, that introduces a virtual LUN object into a storage system component or device, such as a router. (DiCorpo, para. 36). There is no disclosure in the cited DiCorpo of representing a plurality of devices included and supported in device hardware as devices attached to a virtual bus. Instead, the cited DiCorpo

discusses virtual LUNs, not representing a plurality of devices supported in device hardware as attached to a virtual bus as claimed. The Examiner has not cited any part of DiCorpo disclosing the claim requirements concerning initializing a device interface driver to represent the device hardware as a virtual bus.

The Examiner cited para. 36 of DiCorpo as disclosing the claim requirement of generating one device object for each determined device in the device hardware, wherein each generated device object represents the determined device to the operating system. (Final Office Action, pg. 3). Applicants traverse.

The cited para. 36 mentions reducing reduce data transfer errors through LUN virtualization by introducing a virtual LUN object into a storage system component or device, such as a router. A command filter and LUN monitor operate in combination to reduce data transfer errors arising from conflicting commands and task management directives in a multiple-initiator environment through creation of a virtual LUN object. Virtualization can eliminate conflict resolution through physical LUN command queuing and protects the physical LUN state through successive data transfer and media movement operations. The virtualization can be implemented in a storage system element, such as a router, in a manner that requires no configuration changes other than connection to supported hardware.

Although the cited para. 36 discusses introducing a virtual LUN object, there is no disclosure in the cited para. 36 of the claim requirement of generating one device object for each device in the device hardware to represent the determined device to the operating system. Nowhere does the cited para. 36 disclose determining devices within device hardware and then generating a virtual object, or a virtual LUN object in the case of para. 36, for each determined device within the device hardware. Instead, the cited para. 36 discusses creating a virtual LUN object as part of virtualization, not creating a virtual object for each device determined to be in device hardware.

Moreover, the cited para. 36 nowhere discloses the claim requirement that each device object, or virtual LUN in the case of DiCorpo, represents a determined device to the operating system. Instead, LUN virtualization represents one device as comprising multiple virtual storage devices.

In other words, the cited virtual LUN of DiCorpo does not disclose a virtual bus representing a hardware device including devices, where each device in the hardware device

represented by the virtual device is represented by device objects that are represented to the operating system attached to the virtual bus.

Accordingly, claims 1 and 28 are patentable over the cited art because the cited Kim does not disclose all the claim requirements.

Claims 14 and 26 substantially include the requirements of amended claims 1 and 28 and additionally recite a network adaptor including devices instead of device hardware including devices as recited in claims 1 and 28. Applicants submit that claims 14 and 26 are patentable over the cited art for the reasons discussed with respect to claims 1 and 28.

Claims 2, 4, 5, 9, 15, 17, 18, 22-25, 27, 29, 31, and 32 are patentable over the cited art because they depend from one of claim 1, 14, 26, and 28, which are patentable over the cited art for the reasons discussed above. Moreover, the following dependent claims provide additional grounds of patentability over the cited art.

Claims 2, 15, and 29 depend from claims 1, 14, and 28, respectively, and further require reporting to the operating system that the determined devices are dependent on the virtual bus, wherein in response to being notified that the determined devices and virtual bus are dependent, the operating system will not remove the device interface driver representing the virtual bus until the device drivers associated with the determined devices are removed.

The Examiner cited paras. 41 and 114 as teaching the additional requirements of these claims. (Office Action, pg. 3) Applicants traverse.

The cited para. 41 mentions that a storage system may perform one or more of several functions to improve availability, data integrity, and performance. The system can protect the state of the drive when engaged in a data transfer or media movement commands with a primary initiator. The system can avoid unnecessary error recovery and task management traffic, and maintain optimum performance, by supplying expected management data within expected timing specifications to secondary initiators. The storage system can prevent or reduce introduction of new problems for operating systems or backup applications by maintaining the drive's interface specification.

The cited para. 114 mentions that the storage systems commands that report drive state and/or commands that change drive state can be emulated. Commands that change media position, read or write the media access memory, or read or write media may conflict or may be emulated, depending on the amount of virtualization implemented in the embodiment. The

virtual LUN can support a different subset of commands than the physical device since the operating system and applications can be written specifically to support the virtual device. The physical device can be one or more disk devices, one or more tape devices, or a combination.

The cited paras. 14 and 114 discuss storage system operations and that the storage systems report drive state or commands can be emulated, and that the LUN can support a different subset of commands than the physical device. However, there is no disclosure of the claim requirement reporting to the operating system that the determined devices are dependent on the virtual bus, wherein in response to being notified that the determined devices and virtual bus are dependent, the operating system will not remove the device interface driver representing the virtual bus until the device drivers associated with the determined devices are removed. There is no disclosure of notifying the operating system that devices and a virtual bus are dependent.

Accordingly, claims 2, 15, and 29 provide additional grounds of patentability over the cited art because the additional requirements these claims are not disclosed in the cited art.

Claims 4, 17, and 31 depend from claims 1, 14, and 28, respectively, and additionally require that the hardware device comprises a network adaptor and wherein each device available in the network adaptor supports a protocol engine for different communication protocols.

The Examiner cited para. 62 and router 510 as disclosing the additional requirements of these claims. (Final Office Action, pgs. 3-4) Applicants traverse.

The cited para 62 discusses router 510 that transfers commands and data to and from hosts and devices. The router 510 supports different storage devices. Nowhere does the cited para. 62 disclose that devices included in the network adaptor hardware, for which device objects are generated, comprise protocol engines. Instead, the cited paragraph discusses how a router supports transfer of data and commands to and from a host and storage devices.

Accordingly, claims 4, 17, and 31 provide additional grounds of patentability over the cited art because the additional requirements these claims are not disclosed in the cited art.

2. Claims 6-8, 9-21, and 33-35 are Patentable Over the Cited Art

The Examiner rejected claims 6-8, 9-21, and 33-35 as obvious (35 U.S.C. §103) over DiCorpo in view of Brownell (U.S. Patent Pub. No. 2004/0139240).

These claims are patentable over the cited art because they depend from one of 1, 14, and 28, which are patentable over the cited art for the reasons discussed above. Moreover, the additional requirements of these claims in combination with the base claims provide further grounds of patentability over the cited art.

3. Claims 3, 16, and 30 are Patentable Over the Cited Art

The Examiner rejected claims 3, 16, and 30 as obvious (35 U.S.C. §103) over DiCorpo in view of Malueg (U.S. Patent Pub. No. 2004/0003300)

First off, these claims are patentable over the cited art because they depend from one of 1, 14, and 28, which are patentable over the cited art for the reasons discussed above. Moreover, the additional requirements of these claims provide further grounds of patentability over the cited art.

Claims 3, 16, and 30 further require reporting to the operating system that a power state of the virtual bus represented by the device interface driver cannot be altered until all the device drivers representing devices attached to the virtual bus have their power state similarly altered.

The Examiner cited para. 44 and FIGs. 10, 11, and 12 of Malueg as teaching the additional requirements of these claims concerning the power state. (Final Office Action, pg. 8) Applicants traverse.

The cited para. 44 mentions that a power manager arbitrates requests to change state received from drivers 200, 202, and 204 and applications 220 and 222. A driver will not be allowed to transition a component device to a lower state if an application has requested a higher state. The cited FIGs. 10, 11, and 12 discuss device power requirements and handling a request to lower power state that conflicts with device power requirements.

Although the cited Malueg discusses adjusting the power state of devices, nowhere does the cited Malueg anywhere teach that a power state cannot be altered until all the device drivers representing devices attached to the virtual bus have their power state similarly altered. There is no mention in the cited Malueg that the power state of one device cannot be altered until the power state of other devices in the same hardware device have their power state altered. Instead, the cited Malueg discusses whether a power state transition exceeds a high or low requirement for the device.

Accordingly, claims 3, 16, and 30 provide additional grounds of patentability over the cited art because the additional requirements these claims are not disclosed in the cited art.

Conclusion

For all the above reasons, Applicant submits that the pending claims 1-40 are patentable. Should any additional fees be required beyond those paid, please charge Deposit Account No. 50-0585.

The attorney of record invites the Examiner to contact him at (310) 553-7977 if the Examiner believes such contact would advance the prosecution of the case.

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